

## Guest Editorial: the Many Facets of Port Development

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In June 2010 a seminar was organised at Delft University of Technology on recent developments in the field of Ports and Waterways. During the seminar 36 papers were presented and discussed, both academic and more practical oriented. It was intended from the outset to publish a selection of the more academic papers in a special issue of EJTIR, which has resulted in this issue, comprising four papers covering very different areas within the field of ports and waterways.

The common aspect of these papers is that they present the results of academic research, which directly stems from relevant and topical issues in the diverse world of ocean shipping, port development and inland water transport. This close link between research and practice is also characteristic for the work carried out during the past 15 years by the our group of Ports and Waterways in Delft, as outlined in Ligteringen, 2010. The key issues dealt with in the selected papers are: (i) flexibility in infrastructure development, (ii) sustainability and (iii) responsible environmental management. The three are closely related, which becomes clear when we take a closer look. Port and waterway infrastructure is characterized by high capital costs and relatively long economic and (even more) technical lifetime (50-100 years). Facing the great uncertainties related to political, economic and institutional conditions, the chances that investments in new infrastructure will have the anticipated returns are very small. Hence more flexibility is needed in the planning and utilisation of the infrastructure. This directly leads to higher sustainability, as the likelihood decreases that infrastructure, once created, becomes obsolete before the end of its economic lifetime (Charlier, 1992). Even better: flexibility or adaptability should aim to allow the infrastructure to last up till the end of its technical lifetime. Also environmental legislation is changing rapidly and requires more adaptability, not only of infrastructure but also of environmental management within ports and within the shipping sector. The above key issues are the binding factor between the four papers below as will be explained in the following.

The paper by (Taneja et al., 2011), entitled 'Flexibility in port planning and design', deals with the flexibility issue at the level of project planning and financing. The research on which this paper is based started some four years ago. The initial focus was on flexibility in physical infrastructure and the desire to replace the traditional fixed structures in concrete and steel by solutions which would allow more easy adaptation or relocation in case changing circumstances would demand this. This was triggered by the very rapid increase in container ship sizes, which grew during a relatively short period from a capacity of 4500 to 14,000 TEU. In metric units this means that the dimensions Length, Beam and Draught on average increase from (300, 32, 12.5) to (400, 56, 16). A port which had just inaugurated a new container terminal for 8,000 TEU ships, considered by experts as the most probable design ship for the future, was within a few years confronted with the fact that this terminal could not receive the next generation ships. Given the long period

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between project initiation and realisation this confrontation could even happen before the project was finished. Clearly, replacing traditional “fixed” port infrastructure with “flexible” designs (such as a floating or adaptable terminal) would facilitate adaptation or relocation, thus avoiding or minimizing the adverse impacts of such unexpected developments. At the same time, flexible solutions would contribute towards sustainability. The initial research during the first year revealed the inadequacy of traditional practices of port planning and project appraisal in the present uncertain environment. Subsequently the research scope was broadened to include the underlying processes such as planning and design of physical infrastructures. This paper demonstrates the need to revise existing practices in the face of uncertainty, and recommends integrating flexibility and adaptability in planning and design.

One could say that the paper ‘Very long term forecast of the cargo flows in NW-Europe’ by (Van Dorsser et al., 2011) does not deal with flexibility, sustainability or environmental management. But the research project, of which the paper presents a first step, does. The Inland Water Transport (IWT) network in the Netherlands is one of the most dense in the world and has a very high level of utilisation. Yet the infrastructure, e.g. main channel dimensions, locks and bridges across the waterways, is reaching the end of its technical lifetime and during the coming decade important decisions have to be made on replacement, up- or even downgrading. Rijkswaterstaat (RWS), the governmental organisation which prepares these decisions and will have to implement them, is interested in a decision support system which allows them to analyse and evaluate different scenarios. To develop the conceptual framework of this decision support system (DSS) is the subject of the research project. And flexibility, sustainability and environmental soundness will be important evaluation criteria in the DSS. As stated, the paper presents the initial groundwork done for one of the input variables for the DSS, i.e. the forecasts of port throughput over a very long period of time, which form the basis for the volumes of cargo transported by inland waterway. After an extensive literature search the conclusion is drawn that there are no methods available to make forecasts for a 90-year period (up till 2100) and therefore basic research has been carried out on possible relations between port throughput and GDP in the countries concerned. The results show that this is a promising approach, but also that there are limits to what can be forecasted on a very long time horizon..

The paper by (Vantorre et.al., 2011) is also related to hinterland transport over water, but in this case to and from the Belgian coastal port of Zeebrugge via the Westerschelde Estuary. ‘Probabilistic regulation of inland vessels operating at sea as an alternative hinterland connection for coastal ports’ describes a very innovative application of probabilistic analysis to allow inland vessels to navigate safely on relatively short stretches of coastal water. The method was developed by joint research of Ghent University and Flanders Hydraulic Laboratory in response to the need to improve the seaport’s accessibility for inland vessels. The latter are not normally built to sail safely in waves in excess of about 1.0 m. By relatively minor improvements to the ship structural design, so called estuary vessels can navigate the 16 nautical miles (about 30 km) of coastal water between Zeebrugge and the Westerschelde proper under wave conditions up to 1.8 m., subject to additional regulations which have been determined by the probabilistic analysis (taking into account statistical distributions of wave height, periods and directions along the stretch of water). In this paper good environmental management is a key driver, as the shift of (liquid) bulk cargo from the road to the water means a significant reduction of emissions and improved external safety. In addition, making use of the existing waterway is definitively more sustainable than creating a new inland waterway. And finally the transport over water creates greater flexibility for the port of Zeebrugge as its users can now choose between different modes of hinterland transport.

Bunkering means the supply of fuel to ships and this essential service to shipping companies has developed particularly well in those ports, which have oil refineries within their area. The residue of the refining process is traditionally used as bunker oil, which is relatively cheap but

has a very high sulphur content. From the point of view of good environmental management there is great need to reduce the SO<sub>2</sub> emissions and the International Maritime Organisation (IMO) has made a firm regulation in this respect (MARPOL,2008). Implementation of this regulation requires a step-by-step approach in which port authorities can play an important role. On request of two prominent bunker ports, Singapore and Rotterdam, research was carried out by a team from Delft University of Technology on the question whether these two ports should improve collaboration on this matter. The results are given in the last paper, 'Drivers, options and approaches for two seaport authorities on the joint reduction of bunker oil related emissions' by (Stikkelman et al., 2011). The matter is very complex as there are many parties involved and large interests at stake. The study should therefore be seen as a reconnaissance of the problem and no concrete conclusions have yet been drawn. It is however a very good illustration of how systematic policy analysis can help to pave the road towards solutions.

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